TABLE M.5.3.13.1–2.—*Estimated Maximum Mobilizable Radionuclide Inventories (Proposed Action)*

Isotope	Quantity (Ci)
Depleted uranium[a]	
Uranium-234	1.8×10^{-5}
Uranium-235	7.8×10^{-7}
Uranium-238	3.4×10^{-5}
Krypton-83m	1.6×10^{-1}
Krypton-85	1.3×10^{-4}
Krypton-85m	4.4×10^{-1}
Krypton-87	2.5
Krypton-88	1.7
Niobium-98	1.3×10^{3}
Iodine-131	6.2×10^{-2}
Iodine-132	1.6×10^{-1}
Iodine-132m	2.0×10^{-3}
Iodine-133	6.7×10^{-1}
Iodine-133m	1.1×10^{1}
Iodine-134	7.9
Iodine-134m	4.0
Iodine-135	2.3
Iodine-136	2.9×10^{2}
Tellurium-134	2.3×10^{1}
Xenon-133	1.3×10^{-1}
Xenon-133m	5.2×10^{-3}
Xenon-134m	1.6×10^{1}
Xenon-135	7.1×10^{-1}
Xenon-135m	3.2×10^{-1}
Xenon-137	1.7×10^{2}
Xenon-138	5.6×10^{2}
Highly enriched uranium[b, e]	
Uranium-234	6.9×10^{-3}
Uranium-235	2.0×10^{-4}
Uranium-238	1.8×10^{-6}
Krypton-87	4.1
Krypton-88	2.6
Niobium-98	1.2×10^{3}
Iodine-131	5.1×10^{-2}
Iodine-132	1.3×10^{-1}
Iodine-132m	3.0×10^{-2}
Iodine-133	6.1×10^{-1}
Iodine-133m	9.8×10^{1}
Iodine-134	7.9
Iodine-134m	1.7×10^{1}
Iodine-135	2.1
Iodine-136	1.8×10^{2}
Tellurium-134	2.0×10^{1}
Xenon-133	1.2×10^{-1}
Xenon-133m	4.9×10^{-3}
Xenon-134m	3.2×10^{2}
Xenon-135	6.7×10^{-1}
Xenon-135m	1.7
Xenon-137	1.6×10^{2}
Xenon-138	5.6×10^{1}

TABLE M.5.3.13.1–2.—*Estimated Maximum Mobilizable Radionuclide Inventories (Proposed Action) (continued)*

Isotope	Quantity (Ci)
Thorium-232[c]	
Thorium-232	1.0×10^{-5}
Krypton-83m	9.2×10^{-1}
Krypton-85	8.7×10^{-4}
Krypton-85m	3.0
Krypton-87	1.1×10^{1}
Krypton-88	5.6
Niobium-98	8.2×10^{2}
Iodine-131	3.4×10^{-2}
Iodine-132	9.1×10^{-2}
Iodine-132m	2.3×10^{-3}
Iodine-133	4.6×10^{-1}
Iodine-133m	1.3×10^{1}
Iodine-134	6.2
Iodine-134m	4.3
Iodine-135	2.0
Iodine-136	2.5×10^{2}
Tellurium-134	1.8×10^{1}
Xenon-133	9.0×10^{-2}
Xenon-133m	3.7×10^{-3}
Xenon-134m	2.2×10^{1}
Xenon-135	6.2×10^{-1}
Xenon-135m	2.8×10^{-1}
Xenon-137	1.8×10^{2}
Xenon-138	6.2×10^{1}
Tracers: iodine is bounding and representative	
Iodine-124	6.2×10^{-2}
Iodine-125	6.4×10^{-2}
Iodine-126	1.5×10^{-1}
Inner containment vessel, weapons-grade plutonium (nonyield)	3 g
Plutonium-238	1.0×10^{-2}
Plutonium-239	1.8×10^{-1}
Plutonium-240	4.0×10^{-2}
Plutonium-241	9.1×10^{-1}
Plutonium-242	2.4×10^{-6}
Americium-241	1.6×10^{-3}
Inner containment vessel, weapons-grade plutonium (with yield[d])	1 g
Plutonium-238	3.4×10^{-3}
Plutonium-239	5.8×10^{-2}
Plutonium-240	1.3×10^{-2}
Plutonium-241	3.0×10^{-1}
Plutonium-242	7.9×10^{-7}
Americium-241	5.2×10^{-4}
Krypton-83m	1.1×10^{-1}
Krypton-85	3.0×10^{-6}
Krypton-85m	2.6×10^{-1}
Krypton-87	1.6
Krypton-88	9.6×10^{-1}
Niobium-98	1.2×10^{3}

TABLE M.5.3.13.1–2.—*Estimated Maximum Mobilizable Radionuclide Inventories (Proposed Action) (continued)*

Isotope	Quantity (Ci)
Iodine-131	3.7×10^{-2}
Iodine-132	1.5×10^{-1}
Iodine-132m	1.8×10^{-1}
Iodine-133	6.4×10^{-1}
Iodine-133m	3.4×10^{2}
Iodine-134	8.3
Iodine-134m	4.1×10^{1}
Iodine-135	2.1
Iodine-136	1.3×10^{2}
Tellurium-134	1.5×10^{1}
Xenon-133	8.3×10^{-2}
Xenon-133m	4.8×10^{-3}
Xenon-134m	1.7×10^{3}
Xenon-135	7.6×10^{-1}
Xenon-135m	6.0
Xenon-137	1.7×10^{2}
Xenon-138	4.6×10^{1}
Inner containment vessel particulates	
Aluminum-28	2.1×10^{-1}
Silicon-31	8.1×10^{-5}
Phosphorus-30	4.5×10^{-4}
Vanadium-49	1.3×10^{-6}
Chromium-49	2.0×10^{-4}
Chromium-51	1.3×10^{-4}
Manganese-52m	1.5×10^{-5}
Manganese-54	8.7×10^{-6}
Manganese-56	5.8×10^{-2}
Iron-55	2.0×10^{-5}
Cobalt-57	1.5×10^{-5}
Cobalt-58	3.5×10^{-5}
Cobalt-58m	5.1×10^{-3}
Cobalt-60m	3.2×10^{-2}
Cobalt-61	2.2×10^{-4}
Cobalt-62m	4.8×10^{-4}
Nickel-57	1.3×10^{-4}
Nickel-65	1.6×10^{-5}
Niobium-96	3.9×10^{-6}
Niobium-97	2.8×10^{-5}
Niobium-97m	5.5×10^{-4}
Niobium-98	1.6×10^{-2}
Molybdenum-93m	1.3×10^{-6}
Molybdenum-99	5.5×10^{-5}
Technetium-99m	2.2×10^{-5}

TABLE M.5.3.13.1–2.—*Estimated Maximum Mobilizable Radionuclide Inventories (Proposed Action) (continued)*

Isotope	Quantity (Ci)

Source: LLNL 2003d.

[a] Depleted uranium is already slightly radioactive; the half-life of uranium-238 (dominant isotope) is 4.5×10^9 yrs. The assumed composition would be 99.64% uranium-238, 0.36% uranium-235, and 0.0028% uranium-234. The quantities listed correspond to the maximum quantity that would be used under the Proposed Action of 100 g. Fission products would result from a single target (maximum of 2.2 g) subject to 45-MJ fusion yield (4.6×10^{16} fissions) and would include residual fission products from previous yield experiments (60 @ 20 MJ). The fission product inventories provided would be peak post-experiment inventories.

[b] HEU is already slightly radioactive; the half-life of uranium-235 (dominant isotope) is 7.0×10^8 yrs). The assumed composition would be 93.5 wt% uranium-235, 5.4 % uranium-238, and 1.1 % uranium-234. The quantity listed corresponds to the maximum quantity that would be used under the Proposed Action of 100 g. Fission products would result from a single target (maximum of 1.2 g) subject to a 45MJ fusion yield (4.6×10^{16} fissions) and would include residual fission products from previous yield experiments (60 @ 20 MJ). The fission product inventories provided would be peak post-experiment inventories.

[c] Thorium-232 is already slightly radioactive, with a half-life of 1.4×10^{10} yrs). The quantity listed corresponds to the maximum quantity that would be used under the Proposed Action of 450 g. Fission products would result from a single target (maximum of 7.9 g) subject to a 45-MJ fusion yield (5.3×10^{16} fissions) and would include residual fission products from previous yield experiments (60 @ 20 MJ). The fission product inventories provided would be peak post-experiment inventories.

[d] The assumed composition of weapons-grade material would be 0.02% plutonium-238, 93.85% plutonium-239, 5.8% plutonium-240, 0.3% plutonium-241, 0.015% americium-241, and 0.02% plutonium-242. Other isotopic mixes could be used as long as their impacts are within the bounds described here. The fission products would result from a single target (maximum of 1 g) subject to a 45-MJ fusion yield (3.2×10^{16} fissions). Because only a single experiment would occur within an inner containment vessel, only the fission products resulting from this single experiment would be included. The fission product inventories would be peak post-experiment inventories.

[e] Bounds the use of small quantities of specially prepared plutonium.

Ci = curies; g = grams; MJ = megajoules; wt% = percent by weight.

Plutonium Experiment Containment Vessel

For most tests with plutonium[8], an inner containment vessel, presently assumed to be fabricated from stainless steel, would be used to prevent the weapons-grade plutonium[9] and associated fission products from being deposited on the main NIF target chamber, first wall, target positioner, or diagnostics. This inner containment vessel would be brought from the Tritium Facility as a sealed and assembled unit. The vessel would be placed into the target chamber through the large port at the waist of the target chamber or through the bottom of the NIF target chamber. The inner containment vessel would be positioned so that the target would be placed at the target chamber center and the experiment performed using all or a subset of the laser beams. Once the experiment is complete, the inner containment vessel would be returned to the Tritium Facility for post-experiment examination and processing.

Depleted Uranium

Depleted uranium would arrive at the facility in individual targets, each with up to 2.2 grams of depleted uranium. The maximum annual depleted uranium throughput at the NIF under the Proposed Action would be limited to 100 grams. Depleted uranium is slightly radioactive; the half-life of uranium-238 [(dominant isotope]) is 4.5×10^9 years). Depleted uranium is also considered to have toxic properties.

[8] If other fissile materials were required for NIF experiments, the inventories of these materials would be limited such that their environmental impact (offsite accidents, worker exposure, etc.) would not exceed the bounds defined in this document.

[9] The assumed composition of weapons-grade material would be 0.02% plutonium-238, 93.85% plutonium-239, 5.8% plutonium-240, 0.3% plutonium-241, 0.015% americium-241, and 0.02% plutonium-242. Other isotopic mixes could be used as long as their impacts are within the bounds described here.